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# A Demonstration of Some of the Causes of Rotary Lateral Curvature of the Spine.

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Clinical Lecture delivered at the Jefferson Medical College Hospital.

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BY

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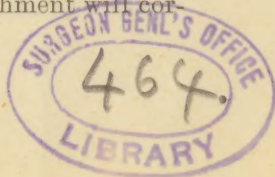
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## A DEMONSTRATION OF SOME OF THE CAUSES OF ROTARY LATERAL CUR- VATURE OF THE SPINE.

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In connection with the anomalous muscular development of the case that Professor Brinton brought before the class last week, I desire to introduce the subject of rotary lateral curvature of the spine, or scoliosis, as introductory to the study of individual cases. You will remember the man had an enormous development of the muscles all over the body, produced, probably, by following some form of the Swedish movements, for his method of bringing into prominence any desired muscle was through the opposing force of other muscles. There is one thing I would ask you to observe, in explanation of the principle upon which this form of gymnastic exercise depends. If I raise my arm simply, I would not do much towards developing my biceps muscle, for it thus simply raises the weight of the forearm. If, however, I will the triceps muscle at the same time, to resist the upward movement produced by the biceps, I find that it is quite another thing, and that the biceps must necessarily begin to develop increased power in proportion to the resistance caused by the triceps, and the triceps develops as the increase in the strength of the biceps. This is a principle I wish you to bear in mind while I am speaking of lateral curvature. The presence of correlation of muscular force prevents a normal body from being deformed, and I believe its reëstablishment will cor-





rect deformity, if applied rationally, and prior to serious bone deformity.

I propose devoting this hour to an introduction, as it were, to the subject; that is, to calling your attention to the essential points of the disease in general, rather than dwelling upon the points presented by a single case. I will bring a model before you, and study with you the production of lateral curvature, and then, at another clinic, I will bring some cases before you to illustrate the various conditions present. I desire at each of my lectures to give to you a kernel of thought, some one thing so condensed as to carry conviction with it, and impress it upon your memories: The essence of to-day's lecture I have written on the board as my text: "Rotary lateral curvature of the spine may be produced by any *persistent* alteration of the relation normally existing between the axes of the hips and shoulders." Now, as a result of the statement made here, I may call your attention to the existence of deformities which produce deformity—or, putting it in another way a little more perplexing, to deformity-producing deformities. Take, as an illustration, flat foot on one side, which will shorten the stature of one side of the body, making one leg shorter than the other, and producing an obliquity of the hips, thus, altering the relationship of the pelvis to the shoulder, curvature follows. If I have a shortened leg, from any cause, on one side, the planes of the pelvis and shoulders diverge and converge in proportion to the asymmetry, and deformity is produced. These deformity-producing deformities are all important as factors in the production of rotary lateral curvature. I shall not occupy much of your time this morning by calling attention to the normal characteristics of the spine, presuming a thorough knowledge on your part of normal structures. The spinal column is made up of a number of small bones or vertebrae, so arranged that they tilt on one another at the will of the person, by the exertion of

muscular force in the desired direction. What holds up this movable spinal column is the action of muscles which, by contracting, force each vertebra against its fellow, making the column rigid. This acts exactly like the rigging holding a mast of a ship. The mast is made up of one piece, it is true, but this piece is composed of a mass of fibres which are held up in position by guy-ropes which firmly draw down upon both sides. If the sail gets off to one side, the drag upon the mast is so heavy that there is a curvature of the latter, and the guy-ropes upon that side become relaxed, while those upon the other are firmly contracted. So in the human body; as I bend my body to one side, the muscles of the convex side are elongated and on the stretch, and those on the concave side shortened by muscular contraction. Now here comes the point. If by muscular action alone a person can be put into a deformed position, if there is persistency in maintaining the deformed position, eventually there is produced a deformity of the bones also. It is this deformity of the bones which is essentially the condition in lateral curvature as a result of some previously existing cause. This deformity of the bones I believe is of a secondary character; the change in the muscle was primary. By means of a model I purpose showing you the formation of lateral curvature of the spine in the normal spinal column, so that you may understand, when you see cases, why certain lesions exist.

*The Side-Saddle.*—I will now call your attention to a factor in the production of lateral curvature which has not received the recognition which it deserves. I realize that I am open to criticism in my statement, but I believe that the side-saddle used by horsewomen is an important factor in the production of lateral curvature. But you say that horseback riding is said to be the best form of exercise. That is true, if you refer to it as taken by yourselves, but not when taken as woman, from the dictates of custom, is compelled

to take it. On this young man, sitting in the position of a woman when occupying the side-saddle, I place this rod in the axis of the shoulders, and another in the axis of the pelvis. You will see that the two are in different planes. A rotation of the vertebræ always accompanies this twisting of the body. Certain muscles are placed at a disadvantage by the position which the patient assumes. However, before this position will produce a deformity, there must be a condition of preceding feebleness, and a persistent or frequent resort to the deforming position.

In recognition of the possibility of the side-saddle being injurious, there are in use side-saddles made with the horns on both sides, so that the rider can from time to time dismount and change sides. There are other side-saddles made with horns that are changeable, to facilitate the accomplishment of the same object and not have the unsightly horns on the side not in use so conspicuous. While this is a step in the right direction in at least the recognition of the liability to produce deformity, it does not go far enough.

I will not permit patients with rotary lateral curvature to use the side-saddle at all, and being loath to deprive some of them of the exhilaration of this form of outdoor exercise, I have had recourse to the use of the bifurcated skirt. The principal objection to its use lies in its making the wearer more conspicuous, and it is therefore difficult to have adopted in or near the city.

The method of riding astraddle, or in the man's saddle, is so entirely different that much of the previous instruction is useless, and riding must be learned all over. Patients who have adopted this method tell me that it is far more easily learned, that they feel safer, and have the consciousness of the horse's movements being freer, from the absence of the necessarily tight girths of the side-saddle.

There has recently been introduced in this city a



riding-school where instruction is given to girls and women wearing the bifurcated skirt, and I hope the time is not far distant when a rider with a bifurcated skirt will attract no more attention than a woman on a bicycle.

*Faulty Positions in School.*—I wish to make another demonstration. Here is a very common fault in the position of children at school. If a leg of a table is in the way, they throw their feet around to one side, but have the shoulders parallel to the table, and as a result there follows a rotation of the spine from the change in the planes of the shoulders and pelvis. If this change is persistent, especially if the child is debilitated, a rotary lateral curvature will be apt to develop.

*Improper Positions in Bed.*—It is stated that one of the most prolific causes of lateral curvature is the position of the body in bed, and I have seen illustrations corroborating the statement. I will put our patient to bed to illustrate this fact, in the position that I have had the privilege of seeing, and in one case I saw upon the bed seven pillows, while the young lady was lying in such a position that lateral curving of the spine could not help resulting. Should the patient occupy this position for seven or eight hours each night, a deformity will result which will become difficult to treat, because of the faulty habit that must be overcome, as well as to reëstablish the muscular functions which are normally engaged in preventing rotary lateral curvature.

*One Short Leg.*—Inequality in the length of the legs is another prolific cause in the production of lateral curvature. When I repeat the statement that has been made, that four-fifths of the human beings have an inequality in the length of their limbs, you can perceive what a field there is here for the production of this deformity from this factor alone. I will shorten this boy's limb by  $1\frac{1}{2}$  inch by means of a block of wood placed under one foot. A lateral cur-

vature of the spine follows, as I readily demonstrate to you by means of the rod. The shoulders are straight, but one side of the pelvis is tilted, and as a result, the spinal column deviates from the straight position. Likewise, sitting with one buttock raised. This is not an uncommon thing to see in girls, who are fond of sitting on one foot on the chair. The change in the position of the shoulders and hips will naturally produce a deviation in the position of the spinal column.

There are other causes of lateral curvature. Thus in patients who have lost a leg, and in those who have an exaggerated development of the muscles on one side, due, for instance, to fencing, producing excessive weight on that side, a curvature often follows. I have seen illustrations of this also in the blacksmith, where the right arm has been used to excess. The same thing will take place if an arm is lost, and the excessive weight of a tumor on one side, or the presence of an enlarged liver, will, it is said, likewise act as the distorting factor. Artificial limbs should be so made that the weight, as well as the length, will be equal to that of the other side, so as to prevent the production of this curving. At the base of all these cases, however, there must be a constitutional defect or feebleness. This feebleness, while it is clearly apparent in defective muscular development, is only in part in these structures, for the osseous system also is at fault, permitting changes in these structures to take place.

Many writers advocate the theory of the primary lesion being in the bones, and while there is plenty of room for doubt in this matter, there is no doubt whatever that the proper development of the muscular system will prevent and correct very decided deformity.

The character of the deformity of the vertebræ, clearly shown in pathological specimens, is that not alone of compression, but of decided torsion. The ante-



rior aspect of the body of a vertebra shows a wedge-shaped condition, due to unequal compression of one side, and this wedge shape increases in intensity, as it were, as each vertebra approaches the point of greatest curvature. The spinous processes are bent and twisted, in proportion to the deviation of the bodies from the normal position, and a factor in this twisting may be found in the strong ligaments that attempt to maintain the correct position. So altered is the appearance of the vertebræ that have been submitted to the forces that produced the deformity, that there is clearly indicated a preëxisting softened condition of the bones, to have permitted such changes without fracture.

When we remember the period at which this curvature is especially prone to manifest itself, that between the ages of 8 and 16 years, we can readily understand that, in many patients, the osseous system is not then prepared to resist the excessive strain that is placed upon it.

If one's muscle can be greatly over-developed, why cannot we train our lateral curvature patients to develop those muscles which shall correct the deformity? There comes a time, however, when the deformity of the bone becomes so pronounced and fixed that the correcting of the deformity is out of the question. Now, as our model bends over, you see the vertebræ more or less prominent, but all in a straight line. If now, in a patient, instead of this, you see the line imperfect, with the position of the ribs distorted, you may make up your mind that the deformity is permanent. If the patient now lies face downward, you see the spinal column in a straight position, and as I place a rod on the shoulder blades, the points are at an equal height. This will not be observed in cases of lateral curvature. If we could get a transverse section of the chest, the outline would be depressed posteriorly on one side, and unduly prominent on the other, elongated laterally.

In rotary lateral curvature of the spine there is a deformity of the thorax, produced by the rotation and resulting deflection of the ribs, which puts the diameters of the chest in very different positions. The ribs are thrown out posteriorly, protruding on one side, while there is a bulging of the opposite side anteriorly. A deformed hip will produce a deformed spine, and this a deformed thorax. Remember, then, that orthopædic surgery is for the *prevention*, as well as for the correction, of deformities.

The reason that a deforming position may be indulged in by many persons for a more or less prolonged time without being followed by rotary lateral curvature, is that this position is not *persistently maintained*, and because the muscles which naturally prevent and correct deformities are all in proper relationship and active.

To produce rotary lateral curvature of the spine, therefore, there must be an enfeebled muscular system, as well as a persistent maintenance of an altered or abnormal relationship between the axes of the hips and shoulders.

I do not feel prepared to condemn corsets or tight lacing because more than three-fourths of all cases of rotary lateral curvature occur in girls, for the reason that there are far more girls without than with scoliosis, and they are all addicted to corsets and more or less improper clothing. But I do most emphatically say that in cases of this deformity, where it is desired that the muscular action should be developed, no clothing should be used which restricts in the slightest degree the full natural play of muscles.

The mother or the patient will at first complain most bitterly of the impossibility of holding the back up, and refer to the backache—all of which is evidence against, rather than in favor of, the use of the corset. The relief from these disagreeable features may be expected just as soon as the muscles which

were made to hold up the spine are acting as they undoubtedly were intended.

For precisely the same reason, let me deprecate the use of any kind of brace or support in the early stages of this deformity. If you are, as I wish you to be, convinced that muscular action is the principal factor in the prevention, and as well in the correction, of the beginning curvature, permit nothing whatever to compromise the efficient and judicious development. There are scattering cases where a modified plan of procedure is required, but I am to-day alluding to the average or typical cases, believing that if you fully appreciate the principles, you will readily apply them to the needs of individual cases.

I deprecate the rest plan of treatment, either prone or supine, because I believe that the girl's system does not require increased feebleness, but increased strength, to resist the progress of the deformity. The deformity has been produced by constitutional debility, and the best method of overcoming that is by judicious exercise, made applicable to the special needs of the patient's condition.

The application of mechano-therapy, or applied gymnastics, to the treatment of rotary lateral curvature, is too large a subject for me to do more than broach in the few remaining minutes. Let me say, that your prescription of exercise should be given with the same care and judgment that you would prescribe any other powerful remedial agent, remembering that harm and serious damage may be done by improper use, and great benefit derived from a skilful application.

How are we going to go about judging the extent of the lateral curvature? The method adopted in the study of a case here is as follows: The seventh cervical vertebra is a very important point to bear in mind in determining the deformity, because it is a decided landmark, easily recognized. We mark this



with a blue pencil, and from this run a line down to the middle point of the sacrum, touching each point over the spinous processes with the pencil. If the column is straight, every prominence of the vertebrae will be in the line of the string. If I draw a line at right angles to this, at the point of the apices of the scapulae, they should be on a level. Again, taking the acromion processes, and holding a string across the back, at right angles to the line of spinous processes, I find in normal cases that they are upon a level. Another way of corroborating the condition is to suspend plumb lines of equal length from each shoulder, and note how near the weights come to the floor on each side. A strip of sheet lead may be used for the purpose of learning the curve of the spine. Starting at the seventh cervical vertebra, and bending it with the fingers to make it correspond to the curve of the spinous processes, and tracing down the back, I am able to get the curvature of the back. Laying this on a sheet of white paper, I mark the curve by means of a pencil. This is sufficiently accurate for all points of clinical recording. I might go farther, and mark on the line the point of each vertebra, but this is usually unnecessary. I can mark this curve on paper with different colors, and thus record the condition of the curves at the time of each of the subsequent measurements. There is a still more satisfactory way of recording the condition of the spine, and that is by means of photography, for it clearly and accurately shows the depression of the scapulae, the prominence of the vertebrae and the depression of the ribs, and every detail of what I term "expression" of the deformity.

It is my experience that photography is invaluable in the study and accurate record of cases of deformity, and especially that form whereby the flash light is available. It is applicable to the privacy of one's office, and thereby avoids the exposure of the

patient to other eyes than those of her medical adviser.

I feel that I have to-day given you only an insight into the subject of rotary lateral curvature; but what I have said will be of service throughout the winter, in the study of the condition and treatment of individual cases.

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